Colombia and *S. palpebralis* of Peru, and makes a third of Dr. Cabanis's section *Schizoaëcha* (J. f. O. 1873, p. 319).

I add a list of the species of *Synallaxis* which have been described since the issue of my synopsis (P. Z. S. 1874, p. 2).

(1) SYNALLAXIS TITHYS, Tacz. P. Z. S. 1877, p. 323.
Hab. Lechugal, N. Peru (*Stolzmann*).

(2) SYNALLAXIS SCLATERI, Cab. J. f. O. 1878, p. 196.
Hab. Sierra de Cordova, reip. Arg. (*Doering*). Allied to *S. humilis*, Cab.

(3) SYNALLAXIS MARANONICA, Tacz. P. Z. S. 1879, p. 230.
Hab. Guajango, N. Peru (*Stolzmann*). Allied to *S. cinerascens*.

(4) SYNALLAXIS RUFIPENNIS, Scl. et Salv. P. Z. S. 1879, p. 620.
Hab. Tilotilo, Bolivia (*Buckley*). Allied to *S. striaticeps*.

(5) SYNALLAXIS FRUTICICOLA, Tacz. P. Z. S. 1879, p. 670.
Hab. Tambillo, Peru (*Stolzmann*). Allied to *S. frontalis*, Pelz.

(6) SYNALLAXIS WHITII, Scl. Ibis, 1881, p. 600, pl. xvii. f. 2.
Hab. Prov. Salta, reip. Arg. (*White*). Allied to *S. scutata*, Scl.

8. On the Muscular Anatomy of *Proteles* as compared with that of *Hyæna* and *Viverra*.

By M. Watson, M.D., Professor of Anatomy, the Owens College, Manchester.

[Received June 19, 1882.]

Having recently had an opportunity of investigating the anatomy of a male specimen of *Proteles cristatus* which lately formed part of the Society's collection, I thought it advisable, considering the rarity of the animal, to make a careful dissection of the soft parts.

The osteology of *Proteles* is already well-known through the works of Isidore Geoffroy St.-Hilaire[1] and of De Blainville[2]; and I need not further refer to it beyond stating that in my specimen, as in that examined by Professor Flower[3], the ribs are fifteen in number on each side, and that the dorsal vertebræ are fifteen and the lumbar five in number. The last rib on each side is extremely short, measuring only one inch in length, and on this account had probably been overlooked by St.-Hilaire and De Blainville, according to both of whom the ribs and dorsal vertebræ of *Proteles* are fourteen in number and the lumbar vertebræ six.

The visceral anatomy of *Proteles* has been so carefully described by Professor Flower[4] that I need not do more than refer to the extremely accurate account of that anatomist. Only in one or two unimportant points did the viscera of my specimen differ from those of Mr. Flower's example. In the latter the small and large intestines measured respectively 9 feet 6 inches and 15 inches in length, while in my own specimen they measured 10 feet 2 inches and 17 inches in length. In my specimen the prostate gland was of much larger size than in Mr. Flower's specimen. As described by him that gland measured, if I understand the figures correctly, three quarters of an inch in length and one inch in breadth; while in my specimen the gland was heart-shaped, the apex of the gland pointing backwards, and measured one inch in length and two inches in its greatest breadth at the base. Similarly in my specimen the anal glands were each twice as large as those described by Flower. The difference in size of the prostate and anal glands in the two specimens is probably due to difference in age. I have before shown[1] that in *Hyæna crocuta* these organs only attain their full size in aged specimens; and the same remark is probably applicable to *Proteles cristatus*.

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[1] Mémoires du Muséum d'Histoire Naturelle, tome xi. 1824, p. 354.

[2] Ostéographie, tome ii. p. 34.

[3] Proc. Zool. Soc. 1869, p. 474.

[4] *Loc. cit.*

In every other respect (with the exception of the brain, which I did not examine) I found that the viscera accurately corresponded with the excellent description of Professor Flower.

In a previous communication[2] I pointed out that in *Hyæna crocuta* the external and internal iliac arteries present a somewhat unusual arrangement, inasmuch as they come off as distinct trunks from the abdominal aorta. In *Proteles cristatus* these arteries present the same peculiarity.

Hitherto, so far as I can ascertain, the muscular anatomy of *Proteles* has not been investigated. With the view of supplementing this deficiency I have carefully compared the muscles of *Proteles* with those of *Hyæna crocuta*. The following notes indicate the points in which the muscular system of the former *differs* from that of the latter animal. It will be understood, where no mention is made of a muscle, that in *Proteles* the arrangement is identical with that which obtains in *Hyæna crocuta*.

In instituting this comparison I have availed myself of the paper on the anatomy of *Hyæna crocuta* contained in the 'Proceedings' of the Society for the year 1879[3].

Muscles of the Head and Neck.

The *sterno-cleido-mastoid* exactly resembles that of *Hyæna*, but differs from that of *Viverra civetta*, in which the "sterno-mastoid is quite distinct from the cleido-mastoid"[4].

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[1] Proc. Zool. Soc. 1878, p. 419, footnote, and P. Z. S. 1881, p. 519.

[2] Proc. Zool. Soc. 1879, p. 79.

[3] Watson and Young, "On the Anatomy of *Hyæna crocuta*," Proc. Zool. Soc. 1879, p. 79.

[4] "On the Myology of *Viverra civetta*," by A. H. Young, M.B., 'Journal of Anatomy,' vol. xiv. This paper is taken as my authority on the myology of the Civet in making the comparison of the muscular anatomy of *Proteles* and *Viverra*.

The *sterno-hyoid* muscles differ from those of *Hyæna* inasmuch as they are inseparably united so as to form a single muscular band from their origin to their insertion. *Proteles* differs in a corresponding manner from *Viverra,* in which the two muscles are quite distinct.

The *omo-hyoid* is absent in *Proteles* as in *Hyæna.* In the latter genus Meckel[1] affirms its presence in *H. striata*; but in *H. crocuta* it is certainly absent.

The *stylo-glossus* of *Proteles* agrees with that of *Hyæna,* but differs from that of *Viverra* inasmuch as it is attached to the *base* of the stylo-hyal bone. In *Viverra* it is attached to the *middle* in length of that bone.

In *Proteles* the *stylo-hyoid* is absent, as in *Hyæna crocuta* and in *Viverra.* In *H. striata* Meckel affirms its presence.

The *scaleni* are arranged much as in *H. crocuta.* As in that species the *scalenus anticus* is absent. The *scaleni medius* and *posticus* in *Proteles* are more closely united than in *H. crocuta,* and form a single mass of fibres arising from the 4th, 5th, 6th, and 7th cervical vertebræ, and inserted into the four anterior ribs. A very slight separation exists between the fibres which are inserted into the first rib and the rest of the muscle. In *Viverra* there are three perfectly distinct scalene muscles.

The *splenius* of *Proteles* exactly resembles that of *H. crocuta.* It differs from that of *Viverra* inasmuch as no part of its fibres is inserted into the cervical vertebræ. Thus in *Proteles,* as in *H. crocuta,* the splenius colli is absent. In *Protelcs,* as in *H. crocuta,* the *complexus* is not divisible into a complexus proper and digastric. In this respect the two species named differ from *H. striata.*

Muscles of the Back, Thorax, and Abdomen.

The *trapezius* of *Proteles* resembles that of *H. crocuta.* In both these species it is relatively of much smaller size than in *Viverra.*

The *latissimus dorsi* in *H. crocuta* arises from the posterior eleven dorsal spines, and has no costal origin. Similarly in *Proteles* the costal origin is wanting, and the spinous origin is limited to the posterior eight dorsal spines. A strong *dorsi epitrochlearis* exists in *Proteles,* as in *H. crocuta.* The insertion of the muscle into the humerus is rather higher in *Proteles* than in *Hyæna.*

The *rhomboideus* in *Proteles,* as in *H. crocuta,* is single. In the former it arises from the last four cervical and two anterior dorsal spines, and is therefore relatively larger than in *H. crocuta.* Meckel states that in *H. striata* this muscle possesses an occipital origin. *Proteles* in this respect differs from *H. striata* and agrees with *H. crocuta.*

The *serrati postici* in *Proteles* are *not* continuous with one another as they are in *H. brunnea* and *Viverra.* In this respect *Proteles* agrees with *H. crocuta.* The serratus magnus of *Proteles* resembles that of *H. crocuta,* but takes an additional attachment to the first rib. In this respect *Proteles* differs from *Viverra.*

[1] Anatomie comparée.

The *obliquus externus abdominis* arises in *Proteles* from the last *ten* ribs. In *H. crocuta* it arises from the last *eleven* ribs.

Muscles of the Fore Limb.

In *Proteles* the *pectoralis major* resembles that of *H. crocuta*, but takes an additional origin from the abdominal aponeurosis. The separation of the muscle into two strata is more complete in *Proteles* than in *H. crocuta*. In the former the posterior fibres form almost a separate muscle, which has a special insertion into the great tuberosity of the humerus; while the anterior fibres are inserted, as in *H. crocuta*, into the whole length of the shaft of that bone. In *Viverra* the muscle is divisible into three strata, and its insertion is confined to the upper third of the humerus.

The *deltoid* muscle is not divisible into two parts as in *H. crocuta*, the two portions being quite continuous with one another.

The *levator humeri proprius* (Douglas) of *Proteles* differs from that of *H. crocuta* inasmuch as it is inserted into the upper end of the radius and more especially of the ulna, and not, as in *H. crocuta*, into the lower end of the humerus. In this respect *Proteles* differs likewise from *H. brunnea* and from *Viverra* (according to the observations of Young [1]). According to Macalister [2], however, in *Viverra* this muscle extends, as in *Proteles*, as low down as the upper end of the radius.

The *levator scapulæ* in *Proteles* is chiefly inserted into the fascia covering the infraspinatus, and to a less extent into the acromion process. In *H. crocuta* the reverse is the case.

The *teres minor* in *Proteles* is quite inseparable from the infraspinatus. In this respect *Proteles* differs from both *H. crocuta* and *Viverra*.

The *brachialis anticus* in *Proteles* is inserted partly into the radius and partly into the ulna. In *H. crocuta* it is inserted into the ulna alone.

The *triceps* of *Proteles* differs from that of *H. crocuta* in the possession of a fifth head. This fifth head forms the most superficial part of the muscle, and consists of a narrow fleshy band which arises from the middle in length of the spine of the scapula, where it lies superficial to the infraspinatus. It passes downwards parallel to and in contact with the glenoid head of the triceps, and is inserted into the olecranon process along with the rest of the muscle. This head is absent not only in *H. crocuta* but in *Viverra*.

The *supinator longus* is entirely absent in *Proteles*, not even being represented by a tendinous band as in *H. crocuta*. In *Viverra* the muscle is quite distinct, although of small size.

The *extensores carpi radiales* resemble those of *H. crocuta* inasmuch as they are partially fused together. In this respect *Proteles* differs from *H. striata*, in which these muscles are quite distinct.

The tendon of the *extensor carpi ulnaris* in *Proteles* gives off a large slip which is inserted into the annular ligament of the wrist. In other respects it resembles that of *H. crocuta.*

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[1] *Loc. cit.*

[2] "The Muscular Anatomy of the Civet and Tayra," Proc. Roy. Irish Acad. vol. i. ser. 2, p. 506.

The *extensor minimi digiti* of *Proteles* resembles that of *H. crocuta* in being inserted into the *two* outer toes, and differs from that of *Viverra,* which gives off slips to the *three* outer toes.

The *extensor indicis* in *Proteles* joins the extensor tendon which passes to the *middle* toe, and thus agrees with that of *H. striata,* and differs from that of *H. crocuta,* which joins the extensor tendon of the *second* toe. In *Viverra* the tendon of this muscle gives off slips to the 1st and 2nd toes.

The *palmaris longus* of *Proteles* resembles that of *H. crocuta,* and differs from that of *H. striata,* the tendon of which blends with the superficial flexor tendons of the toes, as also from that of *Viverra,* which is double.

The *flexor carpi ulnaris* of *Proteles* differs from that of *H. crocuta* and *H. striata* in possessing an olecranoid as well as a condyloid origin. In this respect *Proteles* resembles *Viverra.*

The *flexor carpi radialis* resembles that of *H. crocuta* in being inserted into the base of the second metacarpal bone, and differs from that of *Viverra,* which is inserted into the first as well as the second metacarpal.

The *flexores digitorum* of *Proteles* closely resemble those of *H. crocuta* for the most part, but differ inasmuch as that portion of the common muscle which represents the flexor perforatus digitorum divides only into *three* slips, which are distributed to the three middle toes, while in *H. crocuta* it divides into *four* slips, which are distributed to the four perfect toes. In this respect *Proteles* agrees with *Viverra.* In *Proteles,* moreover, the portion of the muscle which represents the flexor perforans divides into *five* slips, one of which passes to each of the toes; while in *H. crocuta* the tendon of the flexor perforans, in accordance with the reduction in number of the toes, divides only into *four* slips.

The *lumbricales* in *Proteles* are *three* in number, and pass to the three outer toes. In *H. crocuta* there are four, one to each toe.

In *Proteles* the *flexor pollicis* is incorporated with the flexor perforans digitorum; whereas in *H. crocuta,* on account of the rudimental hallux, the flexor pollicis is entirely deficient. In *H. striata,* however, Meckel asserts the existence of this muscle.

The *interossei* in *Proteles,* as in *H. crocuta,* are arranged in two layers, a superficial and a deep. The superficial layer includes two muscles, which differ from the corresponding structures in *H. crocuta* inasmuch as they both arise from the base of the *third* metacarpal bone, instead of one from the third and the other from the fourth metacarpal as occurs in *H. crocuta.* The one passes to be inserted into the inner side of the base of the first phalanx of the fifth toe, whilst the other is inserted into the outer side of the base of the second toe. In *H. crocuta* these muscles are inserted into the outer and middle toes respectively.

The deep layer consists of ten muscles arranged in pairs, two to each metacarpal bone. In *H. crocuta*, on account of the rudimental condition of the inner toe, the deep layer of interosseous muscles consists only of eight muscles.

Muscles of the Hind Limb.

The *gluteus maximus* of *Proteles* resembles that of *H. crocuta*, but differs inasmuch as the posterior portion of the muscle is quite distinct from and not united with the biceps as in *H. crocuta*. In *Viverra* the gluteus maximus presents a totally different arrangement.

The *pyriformis* in *Proteles*, as in *H. crocuta*, *H. striata*, and *Viverra*, is quite distinct from the gluteus medius.

The *gluteus medius* is not divisible into two planes of fibres as in *H. crocuta*.

A *gluteus quartus* is present in *Proteles*, as in *H. crocuta* and *Viverra*. The insertion of this muscle in *Proteles* is considerably lower than in *H. crocuta*. In the latter it occupies the middle of the anterior intertrochanteric line, whereas in the former it is inserted into the inner side of the shaft of the femur half an inch below that line.

There is only a single *gemellus* in *Proteles*. It is a strong muscular bundle which surrounds the tendon of the obturator internus. In *H. crocuta* and in *Viverra* the gemelli are two in number.

The *quadratus femoris* is entirely absent in *Proteles*, which therefore differs both from *H. crocuta* and *Viverra*.

The *semimembranosus*, as in *H. crocuta*, is either absent or is inseparably united with the adductor magnus. In this respect *Proteles* differs from *Viverra*, in which the semimembranosus is quite distinct from the adductor magnus.

The *semitendinosus* of *Proteles* is inserted into the tibia lower down than in *H. crocuta*. In this respect *Proteles* resembles *H. striata*. In *Viverra* this muscle has an additional caudal origin, which is not present either in *Hyæna* or in *Proteles*.

The *sartorius* of *Proteles* differs from that of *H. crocuta* inasmuch as the muscular fibres in the upper third of the thigh form a single mass, which only divides into two parts lower down. In *H. crocuta* the two parts are separate from end to end; in *Viverra*, on the other hand, the muscle is single.

The *gracilis* is not attached directly to the pelvic bone as in *H. crocuta*, but arises from a strong aponeurosis covering the adductor muscles. Its fibres are continuous with those of the opposite muscle. Its insertion differs from that of the muscle in *H. crocuta* inasmuch as the lower fibres are inserted into a stout fibrous band which lies parallel with, and is inserted into the inner side of the tibia at the junction of the lower and middle thirds of that bone.

In *Proteles*, as in *H. crocuta*, the *pectineus* is single at its insertion. In *Viverra* it is double.

The origin of the *adductor brevis* is relatively more extensive in *Proteles* than in *H. crocuta*.

The *rectus femoris* of *Proteles* differs from that of *H. crocuta* and

Viverra, but resembles that of *H. striata*, in the possession of only a single head of origin, the reflected head being absent.

The *soleus* in *Proteles*, as in *H. crocuta*, is absent, whereas in *Viverra* that muscle is present.

The *plantaris* resembles the corresponding muscle of *H. crocuta*, and differs from that of *H. striata* and *Viverra* inasmuch as it is not prolonged to the sole of the foot.

The *popliteus* is of relatively smaller size in *Proteles* than in *H. crocuta*, the belly of the muscle being confined to the upper third of the tibia.

The *tibialis posticus* of *Proteles* resembles that of *Viverra* in the possession of a fibular head of origin. This head is absent in *H. crocuta*. The tendon of the muscle in the latter is inserted into the entocuneiform and scaphoid bones; whereas in *Viverra* and *Proteles* it is inserted into the scaphoid bone alone.

The *flexor brevis digitorum* is represented only by tendon, as in *H. crocuta*, but differs from the latter inasmuch as that tendon is quite continuous with the plantaris. In *H. striata* and *Viverra* the flexor brevis digitorum has a distinct muscular belly.

The origin of the *flexor longus digitorum* in *Proteles* differs from that of *H. crocuta* inasmuch as its inner head arises not only from the head of the fibula, but also from the oblique line of the tibia. The outer head arises, as in *H. crocuta*, from the fibula alone. In *Viverra*, on the other hand, the outer head of the flexor longus is attached to both bones of the leg.

The *flexor accessorius* is absent. *Proteles* in this respect resembles *H. striata* and differs from *H. crocuta* and *Viverra*.

The *lumbricales* of *Proteles* resemble those of *H. crocuta* in being three in number. They are inserted into the second, third, and fourth toes. The inner toe has no lumbrical muscle. In *Viverra* there are four lumbrical muscles.

The *tibialis anticus* in *Proteles* resembles that of *H. crocuta* in having two tendons, one of which is inserted into the entocuneiform, the other into the first metatarsal bone. In *Viverra* the origin of this muscle differs from that of *Proteles* inasmuch as it arises from *both* bones of the leg, and has only one tendon of insertion, which is inserted into the first metatarsal bone.

In *Proteles*, as in *H. crocuta*, the *extensor hallucis* is represented merely by a slip from the tendon of the tibialis anticus. In *Viverra*, on the other hand, the muscle is well developed.

The tendon of the *extensor longus digitorum* of *Proteles* divides, as in *Viverra*, into four slips for the four anterior toes. In *H. crocuta* there are only three slips, which are inserted into the second, third, and fourth toes.

The *extensor brevis digitorum* of *Proteles* differs from that of *H. crocuta* and *H. striata* in giving off only two tendons, which pass to the second and third toes. In *Hyæna* three tendons are given off by this muscle, which are inserted into the second, third, and fourth toes, while in *Viverra* there are four tendons, which pass to the four inner toes.

The origin of the *peronæus longus* is confined in *Proteles* to the tibia and fibula, whereas in *H. crocuta* it has an additional origin from the external condyle of the femur. In this respect *Proteles* agrees with *Viverra*. The muscle in *Proteles* is inserted, as in *H. striata* and *H. crocuta*, into the fifth metatarsal alone, while in *Viverra* it is inserted into the first and fifth metatarsals.

The *peronæus brevis* in *Proteles* gives off two tendons as in *H. crocuta*. One of these corresponds to the peronæus quinti described by Macalister in *Viverra*.

The *interossei* of *Proteles* resemble those of *H. crocuta*. They are eight in number, two being attached to each toe.

In all respects, except those above mentioned, the muscular anatomy of *Proteles* exactly resembles that of *H. crocuta*.

Professor Flower[1] has expressed his opinion, founded on a careful examination of its skeleton and visceral anatomy, that *Proteles* should be placed in a family by itself allied to both Hyænidæ and Viverridæ, but having closer affinities with the former. That conclusion is fully borne out by an examination of the muscular anatomy of the animal. For, while agreeing in many points above referred to with *Viverra*, the muscular system of *Proteles* as a whole presents a much closer approach to that of *Hyæna*.

A. H. Young[2] has well summarized the differences between the muscular system of *Viverra* and *Hyæna* as follows:—

"In the Civet the cleido-mastoid is distinct from the sterno-mastoid; there is also a well-marked splenius colli, and a separate trachelo-mastoid. Three scalene muscles are distinguishable; but in this respect one species of *Hyæna*[3] (*Hyæna brunnea*) agrees with the Civet. In the fore limb of *Viverra* the presence of a long supinator and a flexor brevis manus, together with the double nature of the palmaris longus, the absence of an ulnar insertion of the biceps, and the more marked development and differentiation of the hand muscles, is in striking contrast with what obtains in *Hyæna*.

"The hind limb of the Civet possesses an additional gluteus (quartus), and a semimembranosus, which is not attached to the adductor. There are also a well-developed soleus, and three separate peroneal muscles. Other points worthy of note are to be observed in the undivided condition of the sartorius, the double insertion of the pectineus, the caudal origin of the semitendinosus, and the prolongation of the plantaris tendon to form an origin for the flexor brevis digitorum, whilst in the foot, as in the hand, the intrinsic muscles are well-developed and differentiated.

"In all these respects the Civet differs from the *Hyæna*; the enormous development of the muscles of the neck and fore quarters in the latter animal, which is so characteristic of its genus, has no counterpart in the Civet."

An examination of the muscular anatomy of *Proteles* shows that in all these important particulars, with the single exception of that which relates to the scalene muscles, that genus agrees with *Hyæna* and differs from *Viverra*.

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[1] *Loc. cit.* p. 496.

[2] Journal of Anatomy, vol. xiv. p. 177.

[3] Murie, Trans. Zool. Soc. London, vol. vii.